REMARKS

The specification has been amended to correct errors of a typographical and grammatical nature. Due to the number of corrections thereto, applicants submit herewith a Substitute Specification, along with a marked-up copy of the original specification for the Examiner's convenience. The substitute specification includes the changes as shown in the marked-up copy and includes no new matter. Therefore, entry of the Substitute Specification is respectfully requested.

The claims and abstract have also been amended to more clearly describe the features of the present invention.

Entry of the preliminary amendments and examination of the application is respectfully requested.

To the extent necessary, applicant's petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 01-2135 (503.41022X00) and please credit any excess fees to such deposit account.

Respectfully submitted,

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IN THE CLAIMS:

6. (Amended) A facility management system according to any one of claim 1 to claim ~~5~~ 3, wherein said flow line-measuring means installed in said facility to be monitored and said management information generating means installed in a monitoring center are connected to each other through a communication network.

IN THE ABSTRACT:

~~Even if a layout of a facility is appropriate in the beginning, the layout may gradually become inappropriate with the passage of time. However, since the conventional technologies can~~ Since it is not possible to automatically ~~grasp~~ determine the appropriateness of a layout at present, there has been a problem in that it is impossible to change the layout of the facility at an appropriate timing. To solve this problem, ~~The~~ the appropriateness ~~the~~ a facility is judged based on a movement cost calculated using an automatically measured ~~a~~ flow line of a moving body. In order to attain ~~the object, the present invention comprises a~~ such a result, flow line-measuring ~~means~~ is carried out for measuring the flow line of ~~the~~ a moving body by detecting the moving body ~~in~~ as an object to be monitored; ~~a~~ movement cost-calculating ~~means~~ is carried out for calculating a cost expended on movement of the moving body~~, that is, a movement cost~~ derived from ~~the~~ flow line information; and ~~a~~ movement cost-evaluating ~~means~~ is carried out for judging whether or not a cost calculated by the movement cost-calculating ~~means~~ process is within a permissible range.

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TITLE OF THE INVENTION

FACILITY MANAGEMENT SYSTEM BASED ON FLOW-LINE INFORMATION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a facility management system for effectively using a facility based on information derived from measurement of measured person flow lines.

Prior Art

In order to more effectively use a facility, such as an office building, or a manufacturing line in a factory, for example, various kinds of facility management technologies are being developed.

Among them, there are technologies directed toward achieving more aiming at effective use of a facility by optimizing the a layout of the facility. In regard to a the technology whose purpose is to aiming at optimize the a layout of an office building, a technique known as zoning is described in "Facility Management Guidebook; second edition" (Nikkan Kougyou Shinnbun Co.) p. 356 to p. 359. The Zoning is means a technique for of laying out departments in spaces inside a building so that a company or organization may more effectively function in their spaces. In order to do so, the degree of proximity representing the extent of relationship connection expressing intensities of connection between the departments is are researched, and the departments having a high degree of proximity in their relationship connection with each other are laid out in spaces as close to one another as possible. Therein, it can be considered that, as the degree of proximity degree between

departments is higher, movement more frequently occurs between the departments. Therefore, by the layout described above, it is possible to totally reduce the time expended on movement which produces any value, and accordingly to attain effective use of the office building.

Further, in regard to technologies aiming at optimization of a layout of a manufacturing line in a factory, a method of configuring a semiconductor manufacturing line is disclosed in Japanese Patent Application Laid-Open No.6-84740. In this technology, the manufacturing line is laid out so that moving distances of persons and materials may be shortened under a constraint condition that number of the equipment is suppressed as small as possible. By doing so, it is possible to reduce the time expended on movement, and accordingly to attain effective use of the manufacturing line.

Furthermore, there are technologies for imposing using charge corresponding to using of a facility in order to reduce maintenance and management costs of a commonly used facility or to reduce unfair feeling in sharing of maintenance and management costs. For example, Japanese Patent Application Laid-Open No.6-187348 discloses a method that under assumption of a shopping building having a common parking lot, unfair feeling among the shops is eliminated by determining a share of each shop to the cost of customers parking fares based on a sales volume of each shop to the customers using the common parking lot. Therein,

when a customer leaves the parking lot, a construction ratio of sales for each shop is calculated with reference referring to a POS (Point Of Sale; a point-of-sale information management system) information so as to calculate a share of the parking charges for each shop based on the construction ratio. Thereby, it is possible to impose a realistic charge on each shop with reality and without creating a bad unfair feeling among the shop owners.

Still further, there is a technology for automatically controlling a facility, such as an elevator installed in a building, according to movements of a persons that are undertaken at the for convenience of the persons. For example, Japanese Patent Application Laid-Open No.2000-191246 discloses a technology in which the calling of an elevator is eliminated and the waiting time for of the elevator is shortened. Therein, the object to be controlled relates to an elevator installed in an apartment house, and the elevator is automatically called by anticipating expecting that, when doors at in the common entrance and in at each apartment or unit house are opened or closed, there is high probability of someone taking the elevator. By doing so, the calling operation of calling the elevator becomes unnecessary because the elevator is automatically called by detecting the opening and closing of the doors to the building or apartments therein. In addition, since the elevator can be called from a place distant from the elevator, the waiting time of at the elevator can be shortened.

Further, maintenance work of on a facility, such as cleaning, is generally performed periodically performed after establishing making a maintenance plan. For example, it can be assumed that

cleaning is performed every Monday and Thursday.

Furthermore, Japanese Patent Application Laid-Open No.2000-191246 discloses a person flow line information collecting method and a person flow line information collecting system in which a plurality of picture-taking means are individually installed at a plurality of positions inside a facility, including at an entrance, and individual person flow line information as a function of time is collected by extracting a personal image from captured images. In the personal flow line information, personal attribute information and flow line information are ~~connected~~ correlated to each other, and, accordingly, a store-visiting pattern on ~~the~~ an attribute basis can be automatically collected. Further, Japanese Patent Application Laid-Open No.11-64505 discloses a flow line searching system for calculating and displaying a ~~moving~~ path of movement of a customer by installing transmitters at various positions inside a shop and attaching a receiver to a shopping basket. Since ~~moving~~ the path of movement of a person inside a facility can be certainly ~~grasped~~ determined by the system, the layout inside the facility can be easily changed to a more efficient layout.

Even if a layout of a facility is appropriate in the beginning, the layout may gradually become inappropriate with the passage of time due to a change in ~~a~~ the conditions ~~of~~ under which ~~using~~ the facility is used, which may be caused by changes ~~of~~ in the organization or the like. Therefore, it is important to change the layout, of the facility ~~in~~ at an appropriate tim~~ing~~e by ~~grasping a~~ determining the

condition of appropriateness of the layout at present. However, the conventional technologies in regard to the zoning described above require a large amount of manpower because the status of the layout at present needs to be manually grasped. Therefore, the appropriateness of layout is difficult to be continuously grasped, and accordingly there has been a problem that it is difficult to grasp an appropriate timing of layout change.

Further, the above-described conventional technology in regard to the layout of the manufacturing line in a factory disclosed in Japanese Patent Application Laid-Open No.6-84740 is a technology used in a layout planing stage, and accordingly modification after completion of the layout has not been considered. Therefore, the status of a layout after completion of the layout can not be grasped, and accordingly there has been a problem that it is impossible to change the layout of the facility at an appropriate timing.

Further, the above-mentioned conventional technology in regard to the imposing of parking charge disclosed in Japanese Patent Application Laid-Open No.6-187348 is formed on the premise that the POS is used, there is a problem in that the technology can not be applied to a case where use of the POS is impractical such as a case of an office building.

Further, in the above-mentioned conventional technology in regard to the automatic calling of the

elevator disclosed in Japanese Patent Application Laid-Open No.2000-191246, the cause of calling of the elevator considered is only a single event of opening and closing of the door. Therefore, there is a problem in that application of the technology is limited only to the apartment house of which the residents have high probability of the action pattern of opening the door and then taking the elevator.

Further, the above-mentioned conventional technology in regard to performing of the maintenance work of the facility has the following problem because the maintenance work is periodically performed regardless of the status of using the facility such as number of the users. The problem is, for example, that even if maintenance is necessary, the maintenance is not performed to cause problems on the appearance or the safety, or on the other hand, that even if maintenance is unnecessary, the maintenance is performed to cause unnecessary cost.

Further, the methods of automatically collecting the person flow line information disclosed in Japanese Patent Application Laid-Open No.2000-191246 and Japanese Patent Application Laid-Open No.11-64505 are difficult to collect detailed flow line information including specific attributions of the moving body because an unspecified number of persons are objects to be monitored, and accordingly the usable form of the information is limited to a special use such as layout modification in a facility.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a facility monitoring system which monitors identified persons, that is, identified persons in having a strong connection with a facility of having objects to be monitored such as the employees or the residents of the facility as the objects to be monitored, and which can provide very useful movement cost information.

Another object of the present invention is to provide a facility monitoring system having a movement cost monitoring function which monitors a condition of appropriateness of the layout at present through collection of collecting flow line information of identified persons in having a strong connection with a facility, and which can recommend to a user to the need for a change in the layout at an appropriate timing.

A further object of the present invention is to provide a facility maintenance assisting system for planing an appropriate maintenance work of at a facility corresponding to a using use status id in the facility.

In order to attain the above objects, the present invention is characterized by a facility management system comprising a flow line-measuring means for measuring a flow line of a moving body by detecting the moving body in a facility to be monitored; and a management information generating means for producing management information for management from the flow line information, wherein the management information generating means comprises a moving body identifying means for identifying the moving body; and

a movement cost-calculating means for calculating a cost expended on movement of the moving body from the flow line information, and wherein the movement cost-calculating means calculates the movement cost based on a time unit price specific to the identified moving body and a time period required for the movement as the movement cost.

Further, in order to attain the above objects, the present invention comprises a flow line-measuring means for detecting a moving body in a facility to be monitored, and for measuring a flow line of the moving body; a facility-using status-calculating means for identifying a user from the measured flow line data and facility data of information specific to a facility, such as place the location, of the facility, a the maintenance management cost and so on, and for calculating facility-using status data of information relating to use of the facility, such as the period of use using time, and so on; an imposed charge-calculating means for calculating imposed charge data showing a relationship between an amount of imposed money and a department to be imposed on from the calculated facility-using status data, the facility data and organization data expressing a belonging relationship between said user and the department in the facility; and an accounting processing means for totally performing accounting processing based on the imposed charge data.

Further, in order to attain the above objects, the present invention comprises a flow line-measuring means for

detecting a moving body in a monitored object and for measuring a flow line of the moving body; a flow line history-checking means for judging whether or not the measured flow line data conforms with a flow line history pattern expressing a condition of calling an elevator, and for calling the elevator when the measured flow line information conforms with the flow line history pattern; and an elevator-control means for actually controlling the elevator.

Further, in order to attain the above objects, the present invention comprises a flow line-measuring means for detecting a moving body in a monitored object, and then measuring a flow line of the detected object; a histogram-calculating means for dividing a facility into small zones from based on the flow line data, and then calculating histogram data expressing a using frequency of use for each of the small zones; a histogram-evaluating means for forming a maintenance plan corresponding to the using frequency of use obtained from the calculated histogram using the using frequency; and a facility maintenance planning means for integrating the whole maintenance plan based on the individual maintenance plans.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a block diagram showing the functional structure of an embodiment of a facility management system, including a movement cost monitoring system, in accordance

with the present invention.

FIG. 2 is a block diagram showing the hardware structure of the movement cost monitoring system in accordance with the present invention.

FIGS. 3 (a) and 3(b) are is flowcharts showing the flow of the total processing of the movement cost monitoring system in accordance with the present invention.

FIG. 4 is a diagram illustrating view explaining an example of a flow line measuring unit using video cameras.

FIG. 5 is a view explaining diagram illustrating an example of flow line data obtained by the video cameras.

FIG. 6 is a table showing an example of a data structure of the flow line data obtained by the video cameras.

FIG. 7 is a flowchart showing a flow of movement cost calculation processing.

FIG. 8 is a flowchart showing a flow of flow line length calculation processing.

FIG. 9 is a diagram view showing an example of an output display picture.

FIG. 10 is a block diagram showing the functional structure of the a movement cost monitoring system having a facility layout optimization means.

FIG. 11 is a diagram vie showing an example of calculation of cost corresponding to movement.

FIG. 12 is a block diagram showing the functional structure of a facility using a charge imposing system for an

office building.

FIG. 13 is a block diagram showing the functional structure of a facility using a charge imposing system for a shopping building.

FIG. 14 is a block diagram showing the functional structure of an elevator automatic calling system based on a flow line history.

FIG. 15 is a view diagram showing an example of facility control based on a flow line history.

FIG. 16 is a table diagram showing an example of flow line history checking.

FIG. 17 is a block diagram showing the functional structure of a facility maintenance assisting system.

FIG. 18 is a view diagram showing an example of a flow line histogram.

FIG. 19 is a view diagram showing an example of a person flow measuring system using PHS.

FIG. 20 is a table showing an example of a data structure of flow line data obtained by the PHS.

FIG. 21 is a table showing an example of facility-using status data.

FIG. 22 is a flowchart showing a flow of imposed charge calculation processing.

FIG. 23 is a table showing an example of flow line histogram evaluation.

FIG. 24 is a view explaining diagram illustrating an example of movement the frequency of movement between small zones.

FIG. 25 is a table explaining showing an example of connection degree of relationship between facilities.

FIG. 26 is a view diagram showing another embodiment of a business form in accordance with the present invention in a case where movement costs produced at store A and store B are remotely monitored by a monitoring center.

FIG. 27 is a block diagram showing an example of a detailed functional structure for applying the movement cost monitoring system in accordance with the present invention to the business form of FIG. 26.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below in detail, referring with reference to the accompanied accompanying drawings. FIG. 1 shows the functional structure of a facility management system including a movement cost monitoring system in accordance with the present invention. A monitored object 100 is a zone of the real world to be monitored by the present system, and a moving body, such as a person existing in the zone, is an object to be monitored. The facility management system comprises: a flow line-measuring means 102 for detecting a moving body 100 in the zone 100 of the facility of the monitored object and for measuring a flow line or path of the moving body; and a management information generating means for generating management information for management from based on the flow line information. The management information generating means comprises: a moving body identifying means

for identifying the moving body; a movement cost-calculating means 106 for calculating the ~~a~~ cost expended ~~expened~~ on the movement of the moving body 100 based on ~~from~~ the flow line information; a movement cost-evaluating means 108 for evaluating the calculated cost according to a given standard; a control means for generating a ~~performing~~ display, providing a warning and effecting control based on the movement cost evaluation result; a facility layout-optimizing means, and an output means 112.

As will ~~to~~ be described later, the moving body identifying means specifies a person as ~~of~~ the moving body ~~100~~ through a method of checking ~~a~~ features in a picture of the moving body taken by a video camera and which is processed with pre-stored data or using IC card data or using a PHS terminal.

The flow line-measuring means 102 detects the ~~a~~ moving body in the monitored object 100, ~~and~~ measures the flow line or path of the moving body, and accumulates the result as flow line data 104. The movement cost-calculating means 106 calculates the ~~a~~ cost expended on movement of the moving body. That is, a movement cost is determined from the accumulated flow line data 104. As the movement cost, the ~~a~~ total movement time of the moving body, the ~~a~~ total movement distance of the moving body or the like may be considered. The movement cost-evaluating means 108 compares the movement cost calculated by the movement cost-calculating means 106 with a movement cost-permissible value 110 preset by a user of the present system, and judges whether or not the movement cost is within the permissible range. The output means 112 is a display unit,

such as a video monitor display, and which outputs an image or voice in order to cause make the user of the present system to pay his attention when it is judged that the movement cost at present exceeds the permissible range.

Here, the value of the movement cost calculated by the movement cost-calculating means 106 may be directly output using the output means 112, instead of outputting the evaluated result of the movement cost-evaluating means 108 using the output means 112.

FIG. 2 shows the hardware structure of the movement cost monitoring system in accordance with the present invention. The movement cost monitoring system of the present invention is formed on a set of by a computer system 200. The computer system 200 consists of a central processing unit (CPU) 201, a main memory 202, an external memory 203, an input unit 204, an output unit 205, a flow line measuring unit 206 and a bus 207. The central processing unit 201 is a unit for controlling the whole computer system 200. Here, the central processing unit provides the function of the movement cost monitoring system in accordance with the present invention according to based on programs realizing the functions of the flow line-measuring means 102 stored in the main memory 202, the movement cost-calculating means 106 and the like. The main memory 202 is a memory capable of accessing to data at a high speed, such as a RAM (random access memory), and is capable of temporarily storing a control program and data for use by the

central processing unit 201. The programs etc. for realizing the function of the flow line-measuring means 102, the movement cost-calculating means 106, etc., are read from the external memory 203 and stored in the main memory. The data, such as the flow line data 104 necessary for executing these programs, may be read from the external memory 203 and stored in the main memory 202, if necessary.

The external memory 203 is a unit, such as magnetic disk unit, which is slow in data access, but large in memory capacity compared to the main memory 202, and it semi-permanently stores the control program and the data for the central processing unit 201. The programs etc. for realizing the function of the flow line-measuring means 102, the movement cost-calculating means 106 etc. and the data etc., such as flow line data 104 necessary for executing these programs, are stored in the external memory 203. The input unit 204 is a unit consisting of a keyboard, a mouse and the like, which through which receive operation to of the system by the user of the present system is effected. The output unit 205 is a unit for displaying the a monitored result in a the form of an image, such as a CRT (cathode ray tube) display, a liquid crystal display or the like, or a unit, such as a speaker for notifying indicating the analysis result in a form of sound, such as a warning sound, and The output unit 205 represents materializes the output means 112.

The flow line measuring unit 206 is a unit consisting of a wireless unit, an IC card, and a video camera, and the this flow

line measuring unit 206 represents ~~materializes~~ the flow line-measuring means 102. The measured flow line data 104 is stored in the main memory 202 or the external memory 203. These units are connected to one another by the bus 207 for exchanging data at high speed between the units. As the bus 207, a network, such as Ethernet, having a data transmission speed that is not so high, or ~~the~~ other connecting means may be used.

The flow of the total process of the movement cost monitoring system of FIG. 1 in accordance with the present invention, will be described with reference ~~, referring~~ to the flowcharts shown in FIGS. 3(a) and 3(b). The total process can be roughly divided into two portions. ~~The~~ One is a process of collecting the flow line data, and the other is a process of evaluating the flow line data. These two processes, which are asynchronously processed in parallel ~~. These two processes~~, will be successively described below. Initially, the process of collecting the flow line data, which is shown by FIG. 3 (a), will be described. This is a process for obtaining the flow line of a moving body in the monitored object 100. In Step 300, the process of Step 302 is repeated with a given frequency. The given frequency is ~~means~~, for example, a frequency of once per ~~a~~ second. In Step 302, ~~a~~ the position of ~~the~~ a moving body is measured using the flow line-measuring means 102. By the process s of Step 300 to Step 302 described above, a group of points approximately expressing the flow line of the moving body can be obtained. The result is stored as the flow line data 104.

Next, the process of evaluating the flow line data, as shown in FIG. 3 (b), will be described. This is a process for evaluating the flow line data 104 obtained by the measurement. In Step 350, the user of the present system is made to sets a movement cost-permissible value 110. In Step 352, the processes of Step 354 to 358 are repeated with a given frequency. The given frequency is means, for example, a frequency of once a per month. In Step 354, a movement cost expended on movement of the moving body is calculated using the flow line data for the given time period. In Step 356, it is judged whether or not the calculated movement cost is within the range of the set cost- permissible value. In more detail, when the calculated movement cost becomes larger than the cost- permissible value 110, it is judged that the calculated movement cost exceeds the cost- permissible value. In Step 358, when it is judged in Step 356 that the movement cost exceeds the cost- permissible value, a warning is output to the user of the present system using the output means 112.

An example of a system using video cameras as the flow line measuring unit 206 will be described below. Initially, a plurality of video cameras are installed in a building so as to produce as few places that are incapable of being taken picture viewed by the video cameras, that is, blind spots, as possible. By interconnecting the plurality of video cameras, a person moving on the picture in the zone is traced through image processing to detect the flow line. For example, as seen in Fig. 4, when the person 401 moves along the flow line 402, the person 401 is

traced on the picture by interconnecting the video camera 410, the video camera 411, the video camera 412 and the video camera 413 ~~taking~~ detect a picture of the person 401. Therefore, by ~~setting so~~ establishing a condition such that the actual position of the body in the building can be identified from the position of the body on the picture taken by the cameras, the flow line 402 can be obtained from the picture image.

In a case of using image processing, it is generally difficult to identify a person or a moving means among an unspecified number of persons or moving means taken by ~~the~~ video cameras. However, in the case where the persons or the moving means to be identified are limited to ~~the~~ persons ~~in~~ having a close connection to the facility of the monitored object, a person can be identified by producing specific vectors from images of the persons, and by checking a person with attribute information or the specific vector of each of the persons in a list of monitored persons. In other words, features on the picture of persons to be identified are pre-stored in a database, and a feature on a picture of a person taken at the time of measuring a flow line is compared with the features in the database, and then the person ~~on~~ in a picture taken at the time of measuring a flow line ~~is~~ can be identified as ~~the~~ a specific person in the database whose feature most agrees with the feature on the picture.

An example of a flow line 104 measured by the flow line-measuring means 102 will be explained with reference ~~below, referring~~ to FIG. 5. Since the flow line-measuring means 102

continuously detects positions of a moving body in at a given time interval, a plurality of continuous points on a flow line are measured when a person moves along the flow line. For example, when the person 401 moves along the flow line 402, the person 401 is detected at a train of points , that is, the point 500, the point 501, the point 502, the point 503 and the point 504 are measured. Here, the flow line is approximately expressed by the train of plural points. In order to improve the approximation accuracy, the measurement interval of the flow line-measuring means 102 should be small made dense, or the generally used method of expressing a free curve such as the spline interpolation should be employed.

Description will be made below on an example of a data structure in a case where the flow line data is handled using a computer, will be described with reference referring to FIG. 6. The table 600 is a table for storing data of associated with a plurality of flow lines measured by the flow line-measuring means 102. Measured data for one flow line is stored in each row, that is, each record of the table. The record 602 shows represents an example of stored flow line data for the flow line 402. The record includes a flow line ID in the form of a unique number for identifying measured flow line data, an employee ID in the form of a unique number identifying a person to be measured, and point train information of for a group of points on the flow line. However, it is not always necessary to store all the information described above. Information not used for processes to be executed later may need not be stored. On the

contrary, information in connection with a to the flow line such as the time of measuring the point train other than the above information may be stored, depending on necessity.

Another example of the flow line measuring unit 206 will be described with reference below, referring to FIG. 19. This is a method using a PHS (personal handyphone system), which is of one form of cordless telephone system forms. The PHS is a system which makes it possible to carry on voice communication capable by communicating between a PHS terminal carried with a person and a plurality of base stations placed located inside a building. The PHS terminal can detect an the intensity of an electric field applied by each of the base stations. In general, since the intensity of electric field becomes stronger as the distance between the PHS terminal and the base station is shorter, it can be known determined that the PHS terminal exists at a place near nearest a base station which gives the strongest intensity of electric field to the PHS terminal. Here, since the base stations are fixed inside the building, the place their location can be grasped known in advance, and accordingly the position of the PHS terminal can be roughly identified relative thereto.

By using this mechanism, a flow line of a person having the a PHS terminal can be determined grasped by successively detecting the positions of the PHS terminal. Further, since each of the PHS terminals has a specific identifier, the each PHS terminal can be individually identified. Therefore, by forming a database of persons having PHS terminals in advance, a person having a PHS terminal can be identified.

FIG. 19 shows an example of measuring a flow line using the a PHS when a person 401 having the PHS terminal 1900 moves along the flow line 402. When the person 401 having the PHS terminal 1900 is in a room of the Design[redacted] Department A 1920, it can be recognized that the person 401 is at a place near the base station 1910 because the electric field received from the base station 1910 installed in the same room is considered to be the strongest. Similarly, when the person 401 is in a pathway passageway 1922 or in a room of the Accounting Department 1924, it can be recognized that the person is at a position near a base station 1912 or a base station 1914, respectively. Therefore, it can be understood recognized that the person moves has moved from the position near the base 1910 to the position near the base station 1912, and then finally moves to the a place near the base station 1914.

Since it is difficult to establish an identification understand the expression of the place near the base station 1910 and so on, the place will be hereinafter expressed identified by a name of a zone or area to which the base station belongs. That is, when it is recognized that the person 401 is at the place near the base station 1910, it will be expressed indicated that the person 401 is in the room of the Design[redacted] Department A 1920. According to the expression described above, it can be expressed indicated that the person 401 moves from the Design[redacted] Department A 1920 to the passage 1922, and then finally moves to the Accounting Department 1924. Here, the PHS terminal is regarded as the

person 401.

Other than In addition to the system described above, an entering-and-leaving management system using IC cards and IC card-readers can similarly measure the flow line. The system manages entering and leaving by that the means of an IC card-reader is installed at an entrance of a room, and whereby the IC card possessed by a person is read by the IC card-reader when the person enters into or leaves from the room. Since the system can determine grasp who and when passes through which entrance at which time, the a flow line can be obtained similar to that produced by the flow line measuring unit 206 using the a PHS.

Description will be made below on An example of a data structure in a case where the flow line data that is measured using the system of FIG. 19 is handled using a computer, will be described with reference referring to FIG. 20. The table 2000 is a table for storing data of a plurality of flow lines 104 measured by the flow line-measuring means 102. Measured data for one flow line is stored in each row, that is, each record of the table. The record 2002 shows an example of stored flow line data for the flow line 402. The record includes a flow line ID in the form of a unique number for identifying measured flow line data, an employee ID in the form of a unique number identifying a person to be measured, and point train information consisting of a group of points on the flow line. Here, it is expressed indicated that a person having an employee ID 335 moves along a path from the in order of Designing Department A, to the pathway, and then to the Accounting Department. However, it is not always necessary to store all of the

information described above. Information not used for processes to be executed later need ~~may~~ not be stored. On the contrary, information in connection ~~to~~ with the flow line, such as the time of measuring the point train, other than the above information, may be stored, depending on necessity.

FIG. 7 is a flowchart ~~explaining~~ showing an example of the flow of movement cost calculation processing ~~shown~~ in Step 354 of FIG. 3 in more detail. In this example, the total sum of the movement distances of the moving bodies within a determined time period is considered ~~as the~~ to be a movement cost. When the value is large, it is regarded that the uselessness of the movement is large because the time is expended on useless actions of movement which produce no value. In Step 700, a variable COST storing a value of movement cost to be calculated thereafter is cleared to 0. In Step 702, the processes from Step 704 to Step 706 are repeated for all the flow lines measured within the determined time period. In Step 704, a length of flow line, that is, a flow line length L for a flow line to be processed is calculated. In Step 706, a value calculated by adding the flow line length L to be processed to the value of a variable COST is set to a new value of variable COST. By the processes described above, the total sum of the movement distances of the moving bodies within the determined time period can be calculated as ~~the~~ a variable COST.

Although here the total sum of the movement distances is considered as the movement cost, the total sum of

movement time may be considered as the movement cost. Further, when in taking it into consideration the fact that the cost per unit time, for example, payment per hour, is different depending on the particular moving body, the total sum of the cost per unit time of a moving body and moving time period of the moving body may be considered as the movement cost.

Further, when in taking it into consideration the fact that the cost per unit time or per unit distance is different depending on the moving means, the movement cost may be calculated by weighting the flow line.

FIG. 11 shows a flow line 1150 moved using that involves the use of an elevator 1100 and an escalator 1102. In the case of the flow line 1150, the section BC involves is movement using the elevator 1100, and the section DE involves is movement using the escalator 1102. The other sections involve are movement by walking. Since the running cost and the maintenance cost are different depending on each of the moving means, it is considered that the cost necessary for movement is different depending on the moving means. Therefore, when in taking into consideration the distance unit value cost of the cost when the a moving means is used into consideration, the movement cost may be calculated by weighting with the moving distance depending on the moving means, such as (a the length of the section AB + a the length of the section CD + a the length of the section EF) × the distance unit cost of walking is added to the + a length of the section BC × the distance unit cost of the elevator + a the length of the section DE × the distance unit cost of the escalator. Further,

when ~~in~~ taking into consideration the time unit ~~cost~~ value of the cost when ~~the~~ a moving means is used ~~into consideration~~, the movement cost may be calculated by weighting ~~with~~ the moving time depending on the moving means, such as (~~a~~ the moving time period of the section AB + ~~a~~ the moving time period of the section CD + ~~a~~ the moving time period of the section EF) × the time unit cost of walking added to the ~~+ a~~ moving time period of the section BC × the time unit cost of the elevator + ~~a~~ the moving time period of the section DE × the time unit cost of the escalator.

Here, the movement cost may be calculated by weighting ~~with~~ differently depending on the locations, ~~places~~ even if the same moving means is used. For example, it is more difficult to walk at a place where many persons are coming and going, even when movement is similarly performed by walking. Therefore, in such a case, the weighting should be increased. Similarly, the movement cost may be calculated by weighting ~~with~~ specific information of the moving body, such as payment per hour, age, official position and type of job ~~of the moving body~~. Further, since it is more difficult to walk on a curved flow line than on a straight flow line, the movement cost may be calculated by weighting ~~with a~~ the curvature according to the ~~expressing a curving~~ degree of curvature of the flow line.

FIG. 8 is a flowchart showing ~~explaining~~ an example of the flow line length calculation processing ~~shown~~ in Step 704 of FIG. 7. In this example, the flow line length is approximately calculated ~~by~~ on the basis of the total sum of the lengths of sections

consisting of the flow line data. In Step 800, a variable L storing representing a value of flow line length to be calculated thereafter is cleared to 0. In Step 802, the processes from Step 804 to Step 806 are repeated for a number of sections composing which make up the flow line data. Therein, letting the number of a train of points be n, the number of sections is n-1. In Step 804, a the length of a section S for each of the sections to be processed is calculated. In Step 806, a value calculated by adding the section length S to be processed to the value of variable L is set to a new value of variable L. By the processes described above, the flow line length can be calculated as the variable L.

An example of a display of produced by the output means 112 will be described below, referring with reference to FIG. 9. This view shows an example of a screen that is picture output when a movement cost exceeds a permissible value. On the screen picture, there are displayed a character strings expressing a warning, a calculated movement cost and the permissible value of movement cost. The user of the present system can be informed understood by watching the warning that the movement cost now is in an unpredictable state, and he or she can be make take a measure toward correcting the problem, such as changing the layout. Although in the example the warning is displayed only using the character strings, the warning may be visually displayed using an additional diagram or the like. Further, other display methods, such as sound, a window or a fragrance may be used.

By employing the structure described above, the cost

expended on movement of the moving bodies can be quantitatively calculated, and ~~the~~ a warning can be output to the user of the present system when the cost exceeds the permissible range. Therefore, the user of the present system can change the layout of the facility at an appropriate timing.

Although the above-described embodiment gives only ~~the~~ a warning when the movement cost exceeds the permissible range, a ~~proposed~~ modified plan for changing the layout may be proposed to the user of the present system. In such a case, a facility layout-optimizing means 1000 (as shown in FIG. 10) is newly added to the functional structure shown in FIG. 1. The facility layout-optimizing means 1000 forms an optimized plan of the layout so as to minimize the movement cost and outputs the result when the movement cost exceeds the permissible range. In order to optimize the layout, a layout ~~minimizing~~ which minimizes the movement cost should be calculated by performing a simulation to predict movement costs for all combinations of layouts. In performing ~~the~~ a simulation of the movement cost, the movement cost should be calculated by calculating a relational degree between facilities from actually measured flow line data~~,~~ and then generating a simulated flow line ~~among~~ between the facilities for a given layout with a probability corresponding to the relational degree.

An example of the relational degree between facilities expressing a depth of relation between facilities will be described below~~, referring~~ with reference to FIG. 25.

The relational degree can be obtained by calculating a movement frequency from one facility to the other facility from the measured flow line information, and then dividing the movement frequency by a given time to obtain a movement frequency per unit time. Assuming the given time is one minute, it can be understood from the element 2500 that the flow line from General Affairs Department to Accounting Department occurs with a frequency of 0.1 times per minute. When the value is large, the value expresses that the flow line between the both facilities frequently occurs, and means that the relation between the both facilities is deep.

By employing the structure described above, the user of the present system can immediately make a plan to change the layout since a proposed modified plan of the layout is shown at a timing that the movement cost exceeds the permissible range and the layout should be reviewed.

Another embodiment in accordance with the present invention will be described below, referring to FIG. 12. This embodiment is a system which imposes using charge of a facility based on a using status of the facility calculated from flow line information. In a case of assuming an office building, there are many common facilities such as an elevator, a meeting room, a washroom and so on. In order to maintain these common facilities, maintenance management cost such as maintenance charge, cleaning cost, electricity and heating cost are required. In order to make unfairness as small as possible, the present invention provides a

system for imposing these costs according to the ~~using~~ status of ~~the~~ use of such facilities. For example, every time ~~when~~ an employee uses ~~the~~ a common facility, such as an elevator, a ~~using~~ use charge for the purpose of maintenance management of the facility is imposed ~~to a~~ on the department to which the employee belongs. The functional structure will be described with reference ~~below, referring~~ to FIG. 12. Since the measured object 100, the flow line-measuring means 102 and the flow line data 104 are the same as those described ~~in~~ with reference to FIG. 1, ~~the~~ an explanation thereof is omitted here. A facility-use status-calculating means 1200 calculates facility-use status data 1204 from the flow line data 104 and facility data 1202. The facility data 1202 is information specific to a facility, such as a place, maintenance management cost and so on for the facility requiring a cost for ~~the~~ maintenance management. Further, the facility-use status data 1204 is information relating to use of the facility, such as the user, ~~using time~~ the period of use and so on.

Assuming that a person is regarded as using a facility when the person ~~keeps close to~~ remains in the facility for a given time or longer, the use status of the facility can be calculated by checking the above information with the flow line data 104. An imposed charge-calculating means 1206 calculates imposed charge data 1210 ~~expressing~~ which indicates the relationship between an amount of imposed money and a department to be charged from the calculated facility-use status data 1204, the facility data 1202 and organization

data 1208 ~~expressing~~ representing the relationship between the employee and the employee's ~~belonging~~ department. An accounting processing means 1212 is ~~a means~~ totally in charge of the accounting processing of the company, and it undertakes a ~~makes~~ procedure to impose the facility use charge on the department to which the user of the facility belongs, and then stores the result in accounting data 1214. Although in this embodiment the use charge is imposed on the department to which the user of the facility belongs, the use charge may be imposed directly on the user.

~~Description will be made on~~ An example of a data structure in a case where the facility-use status data 1204 is handled using a computer, will be described with reference ~~referring~~ to FIG. 21. The table 2100 is a table for storing plural kinds of facility-use status data 1204 calculated by the facility-use status-calculating means 1200. Calculated data for one facility use status is stored in each row, that is, each record of the table. For example, the record 2102 includes an employee ID ~~expressing~~ identifying a user of a facility, the ~~used~~ facility, and the starting time of use and ending time of use. However, it is not always necessary to store all the information described above. On the contrary, information in connection ~~to~~ with the use status of the facility other than the above information may be stored, depending on necessity.

FIG. 22 is a flowchart ~~explaining~~ showing the flow of processing of the imposed charge-calculating means 1206.

The processing from Step 2200 to Step 2202 is involves processing for calculating a using the frequency of use for each of the facilities which is used for calculating an imposed charge later. Step 2200 expresses calls for repeating of the processing of Step 2202 for all of the facility-use status data within a given time period. In Step 2202, a using frequency of use for each of the facilities is counted calculated based on the processed facility-use status data. Successively, the processing from Step 2204 to Step 2210 is involves processing for actually determining using a use charge of for the facilities and a department on which the using use charge of the facilities will be imposed. Step 2204 expresses calls for repeating of the processing from Step 2206 to Step 2210 for all of the facility-use status data within the given time period.

In Step 2206, using a use charge of for the facilities in regard to the facility-use status data to be processed is calculated. As the using use charge of the facilities, it is possible to use a value calculated by dividing a cost required for maintaining the facilities during a given time period by the using frequency of use of the facilities. For example, in a facility requiring a maintenance management cost of 1 one million yen per month, the using use charge per 1 each using use becomes 100 yen when the facility is used 10,000 times during 1 a one month period. In Step 2208, a department on which the using use charge calculated in Step 2206 is to be imposed is determined. In order to make the determination, a department to which the user of the facility belongs should

be searched from the organization data 1208. In Step 2210, the information of the calculated using use charge and the imposed identified department is stored in as the imposed charge data 1210.

By employing the structure described above, the present invention can be applied to a building not having the a POS, because the cost for use of the facility can be imposed on the department to which the user belongs.

The present invention also can be also applied to a shopping building occupied by a plurality of retail stores, as well as the office building used in the example of explained in FIG. 12. FIG. 13 shows an example of the such an embodiment. Although in the case of the office building the using use charge of the facility is imposed on the department to which the user of the facility belongs, in the case of the a shopping building, it is considered more appropriate rational that the using use charge of the facility is imposed on a store at which a shopper drops in for shopping. In this case, since the shopper often drops in at a plurality of stores, the using use charge of the facility is imposed on a plurality of stores.

The functional structure of this embodiment will be described below, with reference referring to FIG. 13. Since the components are the same as those the embodiment of explained in FIG. 12, except for use of a store-use status-calculating means 1300, a store data 1302 and a store-use status data 1304, an explanation on of the same components will be omitted here. The store-use status-calculating means 1300 calculates the store-use status data 1304 from the

flow line data 104 and store data 1302. The store data ~~means~~ is information specific to a store, such as ~~place~~ the location of the store etc. Further, the store-use status data 1304 is information on the use of a store, such as a shopper ~~to~~ visiting the store, the ~~using~~ time the shopper remains in ~~of~~ the store and so on. Assuming that a person is regarded as using a store when the person ~~keeps~~ remains inside the store for a given time or longer, the ~~using~~ use status of the store can be calculated by checking the above information with the flow line data 104. An imposed charge-calculating means 1206 calculates imposed charge data 1210 ~~expressing~~ representing the relationship between an amount of imposed money and a store to be charged from the calculated store-use status data 1304, the facility-use status data 1204, the store data 1302 and the facility data 1202. Although in this embodiment the ~~using~~ use charge is imposed on the store which the shopper uses, the ~~using~~ use charge may be imposed directly on the user.

By employing the structure described above, the charge can be imposed even in the case where ~~there are~~ a charge is imposed on a plurality of ~~imposed~~ stores because the cost for use of the facility can be imposed on the store at which the user drops in.

Although the above-described forms of imposing ~~the~~ a ~~using~~ use charge are different between the embodiment of FIG. 12 and the embodiment of FIG. 13, a ~~form~~ system mixing ~~the~~ both forms may be considered. For example, in the case of a shopping building, the scheme used ~~imposing form shown~~ by the embodiment of FIG. 13 is applied ~~to~~ by imposing ~~of~~ a charge caused by the

shopper, and the scheme used imposing form shown in the embodiment of FIG. 12 is applied to by a imposing of charge caused by the employee of the store. By employing the structure described above, the imposing of a charge for using the use of a facility meeting which meets the actual situation can be achieved performed.

Another embodiment in accordance with the present invention will be described below, referring with reference to FIG. 14. This embodiment is directed to a system for controlling a facility ancillary to a building, such as an elevator, an automatic door, and an air conditioner, based on flow line history information. It may be often be observed that a person in charge of sales drops in at a locker room before going out.

In such a case, when a flow line 1522 moving from a locker room E 1502 to a pathway G 1504 is measured after a flow line 1520 moving from Sales Department A 1500 to the locker room E 1502, as shown in FIG. 15, an elevator 1506 is automatically called by considering in anticipation of the fact that the elevator 1506 will be used next with a high probability.

The functional structure will be described below, referring with reference to FIG. 14. This is an example involves the operation of automatically calling for an elevator when a specific flow line history is measured. The flow line-measuring means 102 previously described detects a moving body in a monitored object 1400, 100 and measures the flow line to accumulate the result as flow line data 104. A flow line history pattern 1402 indicates a condition of for calling the elevator. The flow line history pattern may be manually set by a person, or it may be

automatically produced using a computer by analyzing the tendency from past flow line data 104. A flow line history-checking means 1404 judges whether or not the measured flow line data 104 meets the flow line history pattern 1402. If it is judged that the measured flow line data 104 meets the flow line history pattern 1402, the flow line history-checking means 1404 outputs a control signal for calling the elevator 1408 using an elevator-control means 1406.

A Procedure of for checking the flow line history using the flow line history-checking means 1404 will be described below, referring with reference to FIG. 16. The table 1600 is a table for storing plural kinds of flow line data measured by the flow line-measuring means 102, and is the it has a similar format as to that explained shown in FIG 20. A flow line history pattern 1610 expresses indicates that a searched object is follows a flow line of moving movement in the order of a position A 1612, a position G 1614, a position E 1616 and a position 1618. In the table 1600, the flow line data meeting the flow line history pattern 1602 is a flow line record 1604. Therefore, this flow line data is the result checked by the flow line history-checking means 1404.

Although each element of the flow line history pattern 1610 and the point train sequence of the flow line are checked in one-to-one correspondence here, checking by normalized expression commonly used in a character strain sequence check using a computer may be used in order to give achieve fuzziness. For example, in a case where a person moves in

order of AGEG, the flow line measured by the moving speed of movement may sometimes become a form which shows the person staying at the same position plural times, such as AAGEG, AGGEG or the like. However, what is important here is only the order relation of AGEG, and the number of times a person stays at the same position does is not necessary need to be considered. In the present case, the table should be searched by expressing representing the flow line pattern 1610 as "A + B + E + G +" by the normalized expression. There, the character "+" indicates a once-or-more repetition of a character just before the character "+". That is, the pattern meets a flow line of once-or-more repetition of A, once-or-more repetition of B, once-or-more repetition of C and once-or-more repetition of D.

Although calling of the elevator is automated in this embodiment, changing of the operating mode of the elevator may be considered. For example, to in the case of a person moving to the elevator from a clinic, the operating mode may be changed to a wheelchair mode in which a the time period of for keeping the door open of the elevator open is extended, because it possible considered that the person can not move normally. Further, in a case where the moving speed of movement of a calculated flow line is slow, the operating mode may be changed to the wheelchair mode by due to considering the possibility that a the person can not move normally move.

By employing the structure described above, the calling condition of the elevator can be freely set based on the flow line information of a person, and the present embodiment can be applied to a building other than an

apartment house in which action patterns of persons are limited.

Another embodiment in accordance with the present invention will be described with reference ~~below, referring~~ to FIG. 17. This embodiment is directed to a system ~~that~~ in which a place having a particularly high ~~using~~ frequency of use among spatial facilities, such as a room, a pathway and the like, is determined based on ~~the~~ flow line information, and maintenance management is concentrated on the determined place. It is considered that a place ~~of~~ drawing many persons passing through, for example, a pathway in an office building, becomes more dirty compared to ~~the~~ other places in the building. Therefore, by determining that cleaning such a place ~~to clean the place taking~~ should take first preference, cleaning work can be efficiently performed with less cleaning cost. The functional structure will be described ~~below, referring~~ with reference to FIG. 17. The measured object 100, the flow line-measuring means 102 and the flow line data 104 are the same as those ~~explained in~~ described with reference to FIG. 1, and so on ~~the~~ explanation thereof will be omitted here. A histogram-calculating means 1700 calculates histogram data 1702 ~~expressing~~ representing a spatial ~~using~~ frequency of use of a facility. Using the ~~using~~ frequency of use obtained from the calculated histogram data 1702, a histogram-evaluating means 1704 forms a maintenance plan corresponding to the frequency of use~~,~~ and outputs the result to a facilty maintenance planning means 1706 for actually integrating the whole maintenance plan. A concrete example of such a ~~the formed~~ maintenance plan ~~is that~~ involves the issuing of a request ~~of~~ for cleaning a place

having a ~~using~~ frequency of use larger than a given value ~~is issued~~. Further, as for a place having a ~~using~~ frequency of use smaller than a given value, since ~~it~~ this means that persons hardly use the facility, the facility may be eliminated or the layout may be changed.

An example of the outline of the processing of the histogram-calculating means 1700 will be described ~~below~~, with reference ~~referring~~ to FIG. 18. A spatial facility, such as a hallway, is divided into a plurality of small zones, and a value of frequency having number of flow lines passing through each zone is given to the zone. For example, in the case of ~~when~~ a flow line 1800 ~~takes place~~, the values of frequency in each zone, from a small zone 1810 to a small zone 1816 through which ~~where~~ the flow line passes, ~~pass through~~ ~~are~~ is increased by 1 (one) for each of the zones. By applying ~~executing~~ this processing to all of the flow lines occurring during a given time period, the number of ~~the~~ flow lines passing through each of the small zones can be obtained.

Further, information relating to movement between the small zones may be calculated along with ~~as well as the~~ calculation of the frequency of flow lines passing through the small zone. The information relating to movement between the small zones indicates ~~means~~ a probability of movement ~~moving~~, from a small zone to an adjacent small zone or a difference of persons coming in and going out between small zones adjacent to each other. By showing such information to a person, the person can easily grasp the flow of flow lines.

The information relating to movement will be

explained below, referring with reference to FIG. 24. A movement frequency holding zone 2404 and a movement frequency holding zone 2406 for holding information relating to movement between the small zone 2400 and the small zone 2402 are provided between the small zone 2400 and the small zone 2402. The movement frequency holding zone 2404 holds a movement value corresponding to the frequency of movement from the small zone 2400 to the small zone 2402. On the other hand, the movement frequency holding zone 2406 holds a value corresponding to the movement frequency of movement from the small zone 2402 to the small zone 2400. For example, when a flow line 2408 occurs, the value of the movement frequency holding zone 2404 is increased by 1 (one) by considering that since movement from the small zone 2400 to the small zone 2402 has occurred occurs. When a flow line 2410 occurs, the value of the movement frequency holding zone 2406 is increased by 1 (one) by considering that since movement from the small zone 2402 to the small zone 2400 has occurred occurs. Although the relation between the small zone 2400 and the small zone 2402 has been described above, the movement frequency holding zones are similarly provided between the other zones.

By executing such calculating processing of the movement frequency for the flow lines occurring during a given time period, a probability of moving movement from one zone to another zone can be determined known. For example, the probability of moving movement from the small zone 2400 to the small zone 2402 can be calculated by "(the movement frequency from the small zone 2400 to the small zone 2402)/(the total movement

frequency from the small zone 2400 to the all adjacent small zones)". There, the movement frequency of movement from the small zone 2400 to the small zone 2402 is a value held by the movement frequency holding zone 2404. The total movement frequency of movement from the small zone 2400 to the all adjacent small zones is the total sum of the values held by the movement frequency holding zone 2404, the movement frequency holding zone 2412, the movement frequency holding zone 2414 and the movement frequency holding zone 2416. Further, the difference of in the number of persons coming in and going out from one zone to another zone can be determined known. For example, a value of by subtracting a value held by the movement frequency holding zone 2406 from a value held by the movement frequency holding zone 2404, expresses the difference of in the number of persons coming in and going out between the both small zones is obtained. When the value is positive, the value it means that the number of persons going out from the small zone 2400 to the small zone 2402 is larger than number of persons coming in from the small zone 2402 to the small zone 2400. When the value is negative, the value it means that number of persons going out from the small zone 2400 to the small zone 2402 is smaller. When the value is 0 (zero), the value it means that there is no difference between the number~~s~~ of persons going out and coming in.

An example of the outline of the processing of the histogram-evaluating means 1704 will be described below, referring with reference to FIG. 23. Histogram data 2300 is in the form of a table

holding the number of flow lines passing through a facility, that is, a passing-through frequency value, and a numeral the number in each small zone expresses indicates the passing-through frequency. When a frequency value of a small zone becomes larger than a given allowable value, the histogram-evaluating means 1704 judged s that cleaning is required. Here, when the allowable value is assumed to be 700, a group of the small zones 2302 are are designated as objects to be cleaned. The histogram-evaluating means 1704 notifies a facility maintenance-planing means 1706 of the zones as which are objects to be cleaned. When cleaning is completed, the histogram-evaluating means 1704 clears the frequency values to 0 to prepare for cleaning next time. Further, it is possible that the values of the histogram data 2300 are shown to the user to entrust the judgment to the user. In this case, in order to make the histogram data 2300 easily understandable, the visualization technology used in visualization of scientific and technical calculation results should be used. For example, in a case of visualizing scalar quantities, such as the passing-through frequencies of the small zones in the histogram data 2300, the scalar quantities should be displayed by a contour map in which small zones of an equal passing-through frequency are connected by a line. In a case of visualizing vector quantities, such as the movement frequencies between the small zones in the histogram data 2300, the vector quantities should be displayed by a vector map in which the vector is displayed by an arrow. In this case, the length,

the thickness, the color or the brightness of the vector may be varied according to the magnitude of the movement frequency.

By employing the structure described above, effective maintenance management can be performed because a place used by many persons can be determined and maintenance management can be concentrated on ~~the determined~~ that place.

A form of business using the movement cost monitoring system of FIG. 1 will be described below. Therein, the embodiment ~~it~~ is ~~assumed~~ directed to a monitoring service business in which ~~that~~ a monitoring center ~~are~~ integratively monitor[redacted]s flow line statuses in a plurality of stores~~,~~ and recommends ~~an improving~~ measure to improve service to a store when the movement cost ~~of~~ to the store is large. FIG. 26 shows a business form in which ~~that~~ the movement costs occurring at a store A (2600) and a store B (2602) are remotely monitored at a monitoring center 2604. The monitoring center 2604 is connected to the store A (2600) and the store B (2602) by the Internet 2606 to make mutual data exchange possible.

FIG. 27 shows the detailed functional structure for applying the movement cost monitoring system in accordance with the present invention to the business form described above. Although the movement cost monitoring system is functionally similar to the system shown ~~by~~ in FIG. 1, the ~~different point~~ difference is that the functions are distributed and allocated to the stores 2600, 2602 and the monitoring center 2604. A domain 2700 ~~shows~~ represents functions which should be

allocated to the store to be monitored. It can be understood from the figure that a flow line-measuring means 102 and an output means 112 are allocated to the store. On the other hand, a domain 2702 shows represents functions which should be allocated to the monitoring center 2606 for monitoring the stores to be monitored. It can be understood seen from the figure that a movement cost-calculating means 106, a movement cost-evaluating means 108, a flow line data 104 and a movement cost-permissible value 110 are allocated to the monitoring center 2606.

The flow of the processing in the business form is the same as the processing shown by the flowcharts of FIGS. 3(a) and 3(b), and it can be divided into two kinds of processing, that is, the processing for collecting flow line data and the processing for evaluating the flow line data. FIG. 3 (a) is the flowchart showing the processing for collecting the flow line data. This is a process for obtaining the flow line of a moving body in each of the stores to be monitored. In Step 300, the process of Step the 302 is repeated with a given frequency. In Step 302, a the position of the moving body in each of the stores is measured using the flow line-measuring means 102 installed in each of the stores. By the processes of Step 300 to and Step 302 described above, the flow line of the moving body can be obtained. In the monitoring center 2604, the result is accumulated as the flow line data 104.

Next, the process of evaluating the flow line data, as

shown in FIG. 3 (b), will be described. This is a process for evaluating the flow line data 104 obtained by the measurement. In Step 350, a monitoring person of at the monitoring center is made to sets a movement cost-permissible value 110. In Step 352, the processes of Steps 354 to 358 are repeated with a given frequency. In Step 354, a movement cost expended on movement of the moving body is calculated using the flow line data for the given time period by the movement cost-calculating means 106 installed in the monitoring center 2604. In Step 356, it is judged whether or not the calculated movement cost is within the range of the permissible value using the movement cost-evaluating means 108 installed in the monitoring center 2604. In Step 358, when it is judged in Step 356 that the movement cost of a store exceeds the permissible value, a warning is output to a manager of the store to be monitored using the output means 112 installed in the shop.

Since the data necessary for monitoring can be exchanged through the Internet by employing the business form described above, the monitored object and the monitoring center can be separated from each other, and the remote monitoring can be realized. Further, since the monitoring center can exchange data with a plurality of monitored objects, the a plurality of monitored objects can be monitored by a single monitoring center, and, accordingly, an efficient monitoring business can be realized.

According to the present invention, by limiting the

objects to be monitored to specific persons, such as the employees or the residents having strong connection to a facility to be monitored, a condition of appropriateness of the layout can be quantitatively determined grasped in the form of the total flow line length of persons, that is, the movement cost, and a warning can be output to the user of the present system when the movement cost exceeds the permissible value. Therefore, the user of the present system can change the layout of the facility at an appropriate time timing.

Further, according to the present invention, since the cost for using a facility can be imposed on a department to which a person using the facility belongs based on flow line information of the person, the present invention can be applied to a building not having the an OPS.

Further, according to the present invention, since the condition of calling an elevator can be freely set based on the flow line information of persons, there is an effect that the present invention can be applied to the other buildings, as well as an apartment house, where action patterns of persons are limited.

Furthermore, since a place used by many persons can be determined and maintenance management can be concentrated on the determined place, the maintenance management can be effectively performed.